

2022 GREEN GENERATION – YEAR 1

PART THREE – SOLUTIONS FOR REDUCING HARMFUL EFFECTS

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Green Generation is designed for a two-year rotation – the first year will cover aquatic issues, air quality issues and climate change while the second year will cover terrestrial issues and population growth issues.

- Part 3:** Solutions to reversing/reducing human impacts that harm our environment
- A. Legislation and Economic Opportunity for Solving Problems (**Div. C**)
 - B. Sustainability Strategies
 - C. Bioremediation Strategies

SOLUTIONS FOR PRESERVING OUR ENVIRONMENT AND ITS RESOURCES

The Tragedy of the Commons: (1968 paper by ecologist Garret Hardin)

- “Freedom to breed” is bringing ruin to all.
- Global commons such as atmosphere & oceans are used by all and owned by none.
- When no individual has ownership, no one takes responsibility.
- Examples: overfishing in the oceans, over pumping of the Ogallala Aquifer

Resource Utilization

- **Conservation:** management or regulation of a resources to that its use does not exceed the capacity of the resources to regenerate itself
- **Preservation:** maintenance of a species or ecosystem in order to insure their perpetuation (with no concern as to their potential monetary value.
- **Ecosystem Capital:** putting an economic value on a resource
- **Natural Resource:** the biotic and abiotic components that make up natural ecosystems

Pollution Solutions

1. **Prevention** - raw materials, water, energy and other resources are utilized more efficiently, less harmful substances are substituted for hazardous ones, and toxic substances are eliminated from the production process
2. **Cleanup** – environmental remediation to remove present pollutants from the environment

POLLUTION PREVENTION

- Should be emphasized over remediation.
- Prevention and protection are essential, better for the ecosystem, less expensive than remediation and overall, more effective.
- Conservation, preservation, identifying and setting aside critical habitat is essential and more important than clean ups.

ENVIRONMENTAL REMEDIATION

Environmental remediation is the removal of pollution or contaminants from the environment

Strategies and techniques include (coordinated by EPA)

- Site assessment and mapping
- Excavation and dredging
- Pump and treat
- Solidification and stabilization
- Oxidation
- Soil vapor extraction
- Bioremediation – using microbes to remove pollutants
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Remediation for Water Pollution

Involvement at many levels to prevent sources of pollution

- individuals
- communities
- industries
- states
- federal governments

Stabilization of the ecosystem

- significant remedy to control water pollution
- the reduction in waste input
- harvesting and removal of biomass
- trapping of nutrients
- fish management
- aeration

Reutilization and recycling of water

- industrial effluents (as paper pulp or other chemicals),
- sewage of municipal and other systems
- thermal pollutants (waste water etc.) may be recycled to beneficial use.

Removal of pollutants

- Various pollutants (radioactive, chemical, biological) present in water body
- Using appropriate methods or remedy like adsorption, electro-dialysis, ion-exchange, reverse osmosis etc.



Construction



Wastewater Disposal



Agriculture



Mining



Home & Garden



Logging

SUSTAINABILITY STRATEGIES

Sustainability - biological systems enduring and remaining diverse and productive thus the ability to meet the current needs of humanity without compromising the ability of future generations to meet their needs and maintain a healthy world environment

Strategies include

- Minimize energy consumption & using alternate energy
- Minimize water consumption
- Minimize negative environmental impacts
- Minimize waste generation and recycling
- Develop eco-friendly products and processes

Strategies for a Sustainable World

- advancing technologies to reduce waste
- increasing recycling and reuse
- creating even safer treatment and disposal options
- developing sources of renewable energy
- sharing the benefits of our learning and innovation

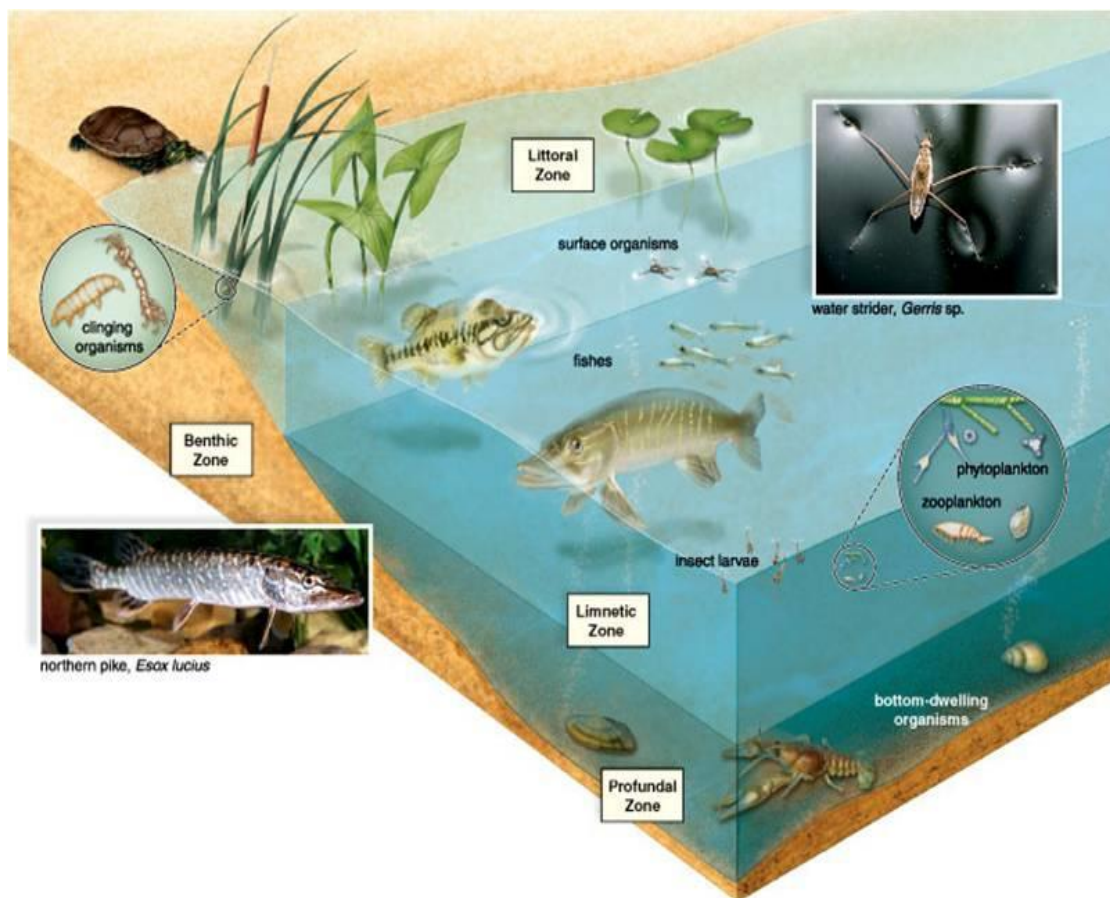
Maintaining Biodiversity

- **Conservation:** allowing the use of resources in a responsible manner
- **Preservation:** setting aside areas and protecting them from human activities
- **Keystone species:** species whose role in an ecosystem are more important than others (sea otters, sea stars, grizzly bears, prairie dogs)
- **Indicator species:** species that serve as early warnings that an ecosystem is being damaged ex. trout



MAINTAINING BIODIVERSITY

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- **Indicator species:** species that serve as early warnings that an ecosystem is being damaged
- **Characteristics of endangered species:** small range, large territory, or live on an island
- **Endangered species:** a group of organisms in danger of becoming extinct if the situation is not improved; population numbers have dropped below the critical number of organisms; North spotted Owl (loss of old growth forest), Bald Eagle (thinning of eggs caused by DDT), Piping Plover (nesting areas threatened by development), and many others
- **Invasive/Alien/Exotic species:** non-native species to an area; often thrive and disrupt the ecosystem balance; examples: kudzu vine, purple loosestrife, African honeybee “killer bee”, water hyacinth, fire ant, zebra mussel, gypsy moth, Asian Long Horned Beetle
- **Billions of Dollars** are being spent to prevent the introduction and spread of Invasive Species as well as controlling Invasive species who are already disrupting aquatic environments.
- **Science Olympiad** has a new event “**Invasive Species**” that addresses these issues. It comes into the taxonomy rotation in 2016.



GREEN INFRASTRUCTURE

- G.I. is going to be key to adapt to climate change, prevent non-point runoff, prevent dead zones, increase habitat resiliency, etc.
- Build up ecosystem resilience to help prevent pollution.
- Section 502 of the Clean Water Act defines green infrastructure as "...the range of measures that use plant or soil systems, permeable pavement or other permeable surfaces or substrates, stormwater harvest and reuse, or landscaping to store, infiltrate, or evapotranspire stormwater and reduce flows to sewer systems or to surface waters." [What is Green Infrastructure? | Green Infrastructure | US EPA](#)

AGENCIES FOR ENVIRONMENTAL PROTECTION

- **World - United Nations Environmental Program (UNEP)** <http://www.unep.org/>
- **US - United States Environmental Protection Agency (EPA)** <http://www.epa.gov/>

ECONOMIC OPPORTUNITIES – Div. C

- Support careers in Environmental Remediation and Green Jobs
- Development of Environmentally Safe Products and Processes which are economically sound
- Encourage Economic Growth that is environmentally beneficial
- ***The Green Economy Report*** is compiled by UNEP's Green Economy Initiative in collaboration with economists and experts worldwide. It demonstrates that the greening of economies is not generally a drag on growth but rather a new engine of growth; that it is a net generator of decent jobs, and that it is also a vital strategy for the elimination of persistent poverty.
http://www.unep.org/greeneconomy/Portals/88/documents/ger/ger_final_dec_2011/Green%20Economy_Report_Final_Dec2011.pdf
- ***A guidebook to the Green Economy***
http://www.uncsd2012.org/content/documents/528Green%20Economy%20Guidebook_100912_FINAL.pdf
- ***The United States Bureau of Labor Statistics (BLS)*** <http://www.bls.gov/> recently began measuring green jobs with the introduction in 2010 of their Green Jobs Initiative. This is an effort to gather data on "(1) the number of and trend over time in green jobs, (2) the industrial, occupational, and geographic distribution of the jobs, and (3) the wages of the workers in these jobs" (BLS 2012c).
- "The BLS defines green jobs as either: (1) Jobs in businesses that produce goods or provide services that benefit the environment or conserve natural resources, or (2) Jobs in which workers' duties involve making their establishment's production processes more environmentally friendly or use fewer natural resources" (BLS 2012c). Jobs are considered green if they produce goods or services directly related to:
 1. Energy from renewable sources.
 2. Energy efficiency.
 3. Pollution reduction and removal, greenhouse gas reduction, and recycling and reuse.
 4. Natural resources conservation, organic agriculture and sustainable forestry.
 5. Environmental compliance and regulatory administration, education and training, and public awareness and advocacy. (BLS 2012c).
- According the first Bureau of Labor Statistics data, in 2010, 3.1 million jobs in the U.S. were associated with the production of green goods and services, accounting for 2.4 percent of total U.S. employment in that year. Of the total, 2.3 million jobs were in the private sector, and 860,300 in the public sector (BLS, Mar 2012, 1).
- Green Career Articles <http://www.bls.gov/green/greencareers.htm#articles>
 - Water Conservation

- Sustainable Forestry
- Biofuels
- Geothermal Energy
- Environmental Remediation
- Sustainability
- Energy Auditors
- Recycling
- Electric Vehicles
- Green Construction
- Solar Power
- Wind Power

LEGISLATION AND POLICIES – Div. C

International Treaties, Laws and Conventions

- **IUCN (International Union for Conservation of Nature)** *International Red List of Endangered Species*
- **Convention on International Trade in Endangered Species (CITES):** lists species that cannot be commercially traded as live specimens or wildlife products.
- **Madrid protocol:** Moratorium on mineral exploration for 50 years in Antarctica
- **Kyoto Protocol** of 1997: Controlling global warming by setting greenhouse gas emissions targets for developed countries. Not signed by the U.S.
- **Montreal Protocol** of 1987: A plan to limit and eventually phase out ozone depleting substances (CFC's)
- **Earth Summit:** held in 1970's, discussed clean water and air. Held in South Africa. The last summit tried to pass a world law by the year 2010 that 15% of our power was to be created by air and solar power. But the Summit was shut down.
- **The World Trade Organization (WTO):** designed to make international trade more fair and encourage development. It has been used to subvert national environmental laws. Has the effect of hurting small, local farmers and businesses.
- **North American Free Trade Agreement (NAFTA):** Trade alliance between U.S., Canada and Mexico
- **Stockholm Convention on Persistent Organic Pollutants: (2004)** Seeks to protect human health from the 12 most toxic chemicals (includes 8 chlorinated hydrocarbon pesticides / DDT can be used for malaria control)
- **Convention on International Trade in Endangered Species (CITES): (1973)** lists species that cannot be commercially traded as live specimens or wildlife products
- **Paris Climate Change Agreement (2016):** goal to limit global warming

KEY US ENVIRONMENTAL LAWS <http://www2.epa.gov/laws-regulations/laws-and-executive-orders>

- **Clean Air Act (CAA)** of 1970: established national primary and secondary air quality standards. Set emission standards for cars, and limits for release of air pollutants.
- **Clean Water Act (CWA)** of 1972: set maximum permissible amounts of water pollutants that can be discharged into waterways and created pollutant discharge permits. Goal: To make all water swimmable and fishable.
- **Water Quality Act** of 1965: attempt to reduce non-point source pollution by creating government watch dog under Dept of Health, Ed and Welfare.
- **Emergency Planning & Community Right-To-Know Act (EPCRA)**

- ***Endangered Species Act : (1973)*** identifies threatened and endangered species in the U.S., and puts their protection ahead of economic considerations
- ***Federal Insecticide, Fungicide and Rodenticide Act (FIFRA) of 1947*** regulates the manufacture and use of pesticides
- ***Freedom of Information Act (FOIA)***
- ***National Environmental Policy Act (NEPA)*** of 1969: Environmental Impact statements must be done before any project effecting federal lands is started. Created a council on environmental quality.)
- ***Occupational Safety and Health Act (OSHA)***
- ***Oil Pollution Act of 1990 (OPA)***
- ***Pollution Prevention Act (PPA)***
- ***Resource Conservation and Recovery Act (RCRA)***
- ***Safe Drinking Water Act (SDWA)*** of 1974: set maximum contaminant levels for pollutants that may have adverse effects on human health.
- ***Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA or Superfund)***
- ***Superfund Amendments and Reauthorization Act***
- ***Toxic Substances Control Act (TSCA)*** of 1976: EPA- ban or regulate chemicals deemed a risk to the health of the environment.)
- ***Wilderness Act*** of 1964: established the national wilderness preservation system
- ***Endangered Species Act*** of 1973: protects threatened and endangered animals in the US, and puts their protection over economic considerations.
- ***Superfund Amendments and Reauthorization Act (SARA)***: increased superfund to \$8.5 Billion. Shares responsibility for cleanup among potentially responsible parties.
- ***Resource Conservation & Recovery Act (RCRA)*** of 1976: Controls hazardous waste with a cradle to grave system from storage, treatment, transportation to disposal.
- ***Surface Mining Control & Reclamation Act*** of 1977 (SMCRA): requires coal strip mines to reclaim the land
- ***Comprehensive Environmental Response, Compensation and Liability Act (CERCLA)*** of 1980: Created \$1.6 billion superfund designed to identify and clean up abandoned hazardous waste dump sites. Established liability for cleanup costs if source could be identified.
- ***Ocean Dumping Ban Act*** of 1988: Bans dumping of sewage, sludge and industrial waste into oceans.
- ***Food Quality Protection Act*** of 1996 (FQPA): Set pesticide limits in food, and all active and inactive ingredients must be screened for estrogenic/endocrine effects.
- ***Low Level Radioactive Policy Act***: all states must have facilities to handle low level radioactive wastes.
- ***Nuclear Waste Policy Act***: US government must develop a high level nuclear waste site by 2015
- ***Coastal Zone Management Act (CZMA)***- A 1972 Federal law that provides guidance and federal assistance to voluntary state and local coastal management programs. Goals are for the protection of natural resources and management of land development along coasts.
- ***Federal Land Policy and Management Act (FLPMA)***- A 1976 Federal law that outlines procedures concerning the use and preservation of public US lands.
- ***Food Drug and Cosmetic Act***- A federal law passed in 1906 that regulates the sanitary condition and safety of food, drugs and cosmetics. It includes food additives.

Laws and Policies by Topic

GENERAL

- **National Environmental Policy Act: (1969)** Environmental Impact Statements must be done before any project affecting federal lands can be started
- **Pollution Prevention Act of 1990** "source reduction and other practices that reduce or eliminate the creation of pollutants through increased efficiency in the use of raw materials, energy, water, or other resources, or protecting resources through conservation"
- **Stockholm Convention on Persistent Organic Pollutants: (2004)** Seeks to protect human health from the 12 most toxic chemicals (includes 8 chlorinated hydrocarbon pesticides / DDT can be used for malaria control)

WATER

- **Safe Drinking Water Act: (SDWA, 1974)** set maximum contaminant levels for pollutants in drinking water that may have adverse effects on human health
- **Clean Water Act: (CWA, 1972)** set maximum permissible amounts of water pollutants that can be discharged into waterways; aims to make surface waters swimmable and fishable
- **Ocean Dumping Ban Act: (1988)** bans ocean dumping of sewage sludge and industrial waste in the ocean

AIR

- **Clean Air Act: (CAA, 1970)** set emission standards for cars and limits for release of air pollutants
- **Kyoto Protocol: (2005)** controlling global warming by setting greenhouse gas emissions targets for developed countries
- **Montreal Protocol: (1987)** phase-out of ozone depleting substances

WASTE, SOLID AND HAZARDOUS

- **Resource Conservation & Recovery Act (RCRA): (1976)** controls hazardous waste with a cradle-to-grave system
- **Comprehensive Environmental Response, Compensation & Liability Act (CERCLA): (1980)** "Superfund," designed to identify and clean up abandoned hazardous waste dump sites
- **Nuclear Waste Policy Act: (1982)** U.S. government must develop a high level nuclear waste site (Yucca Mtn)
- **Food Quality Protection Act (FQPA, 1996):** set pesticide limits in food, & all active and inactive ingredients must be screened for estrogenic/endocrine effects

MINING

- **Surface Mining Control & Reclamation Act: (1977)** requires coal strip mines to reclaim the land
- **Madrid Protocol: (1991)** Suspension of mineral exploration (mining) for 50 years in Antarctica
- **Madrid Protocol: (1991)** Moratorium on mineral exploration for 50 years in Antarctica

LIFE

- ***Endangered Species Act: (1973)*** identifies threatened and endangered species in the U.S., and puts their protection ahead of economic considerations
- ***Convention on International Trade in Endangered Species (CITES): (1973)*** lists species that cannot be commercially traded as live specimens or wildlife products
- ***Magnuson-Stevens Act:*** (1976) Management of marine fisheries
- ***Healthy Forest Initiative: (HFI, Healthy Forests Restoration Act of 2003)*** thin overstocked stands, clear away vegetation and trees to create shaded fuel breaks, provide funding and guidance to reduce or eliminate hazardous fuels in national forests, improve forest fire fighting, and research new methods to halt destructive insects

Reference List for Images by Page

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“Pollution.” Lake Scientist, www.lakescientist.com/pollution/.

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Image 1 no longer available on web except in previous SO material.

Page 4

Image 1 no longer available on web except in previous SO material.